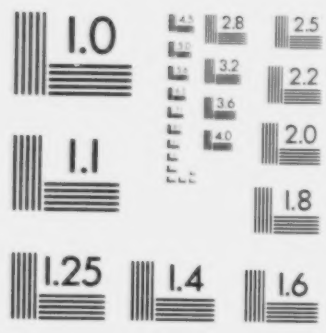
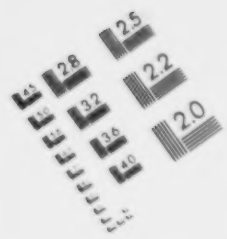
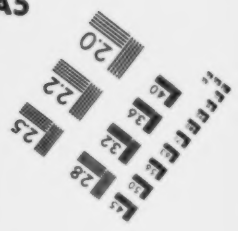


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IDENTIFIERS Lookback Strategy

ABSTRACT

A study examined the use of lookback strategy (selective rereading of text material to clarify inconsistent information) employed by good and poor readers attempting to monitor their own reading comprehension. Using microcomputers, narrative and expository texts containing inconsistencies were presented one line at a time on a "page" of screen. The reading times, use of lookbacks, and verbally reported identification of inconsistencies of five classes of fifth grade pupils were examined. Results for both types of text in the three areas measured indicate the following: (1) good readers spent less time on text than did poor readers, and both groups spent less time on lookbacks than on text; (2) good readers used lookbacks more often and more strategically than did poor readers; (3) when reading expository text, poor readers used a similar number of lookbacks regardless of the presence of inconsistencies; and (4) good readers more readily identified more inconsistencies than did poor readers. Strategic use of lookbacks, rather than reading time, appears to be a sensitive behavioral indicator of good readers identification of inconsistent information, whereas neither reading time nor use of lookbacks appears to relate to poor readers' verbal identification of inconsistencies. A list of references and tables of data conclude the report. (LL2)

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A COMPUTER-ASSISTED ON-LINE INVESTIGATION
OF COMPREHENSION MONITORING

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March 1986

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ABSTRACT

Using microcomputers, fifth grade pupils identified as good or poor comprehenders were presented narrative or expository texts containing inconsistencies. Reading time and lookback data were recorded and pupils were queried to determine their awareness of inconsistent information. When compared to poor readers, good readers more readily identified the inconsistent information. Good readers also were more strategic in their use of lookbacks, targeting their lookbacks to lines containing inconsistencies. This strategic use of lookbacks characterized good but not poor readers who identified the inconsistent information.

A COMPUTER-ASSISTED ON-LINE INVESTIGATION OF COMPREHENSION MONITORING

Knowing when and what you don't understand has been identified as an important comprehension process (Baker, 1979; Baker & Brown, in press; Brown, 1980). If readers can effectively identify the basis for their comprehension failures, they are more likely to engage in strategies that will facilitate their understanding of texts. With this perspective, investigators using a variety of experimental procedures have examined comprehension monitoring performance developmentally and between good and poor and younger and older readers (For a review see Wagoner, 1983).

One of the more prevalent paradigms used in the study of comprehension monitoring involves the use of an error detection task in which readers are asked to assist the experimenter in identifying any problems in the texts. The nature of the errors included spelling errors, logical inconsistencies, and anomalous sentences (Winograd & Johnston, 1982). While investigators have rather consistently reported that better and older readers more readily identify text problems than do poorer and younger readers (Wagoner, 1983), it has been noted that many competent readers fail to identify text errors (Winograd & Johnston, 1982). Experimenters have noted that readers' failure to mention the errors may not mean that these individuals are not adequately monitoring their comprehension (Baker, 1979; Markman, 1979; Winograd & Johnston, 1982). That is, readers may effectively monitor their comprehension but be unwilling to report the errors. Competent readers also may not perceive the error due to their generative ability to integrate anomalous material into the main text.

Most of the previously noted studies have focused on readers' verbal responses to nonspecific probes as the primary indicator of comprehension

monitoring. Reflecting on information-processing literature, Ericsson and Simon (1980) have questioned the validity of this type of verbal report data as a measure of cognitive processing. On-line measures of readers' behaviors while engaged in an error detection task may be a better indicator of comprehension monitoring. That is, if readers recognize that they are having some difficulty understanding a text, it should be reflected in how they read. August, Flavell, and Clift (1984) found that skilled readers spend relatively more time reading texts that contain inconsistencies. However, reading time was not closely associated with readers' identification of the inconsistencies. Harris, Kruithof, Terwogt, and Visser (1981) reported that older pupils' greater identification of text inconsistencies was not contingent on changes in reading rate. These results appear to provide further support for the view that many verbal report measures of metacognitive functioning may be poor indicators of cognitive processing (For a related discussion in metamemory research, see Schneider, 1985).

Identifying the comprehension difficulty is an important precursor to selecting and using a remediation strategy (Collins & Smith, 1980). A strategy that has received a great deal of attention is selective rereading of text material, i.e. lookbacks. Use of the lookback strategy appears to facilitate comprehension (Alessi, Anderson, & Goetz, 1979) and is used to a greater extent by competent readers (Garner & Alexander, 1982). If students are effectively monitoring their comprehension during an error detection task, they may exhibit patterns of lookbacks indicating sensitivity to the presence of anomalous or inconsistent material. Using PLATO computer terminals, Baker and Anderson (1982) found that college students looked back more often and spent more time on text lines containing information that was inconsistent with information presented elsewhere in the passage.

To date, there is little information on elementary school-aged readers'

on-line reading rate and use of lookbacks while reading error detection tasks. Through the use of computer-assisted text presentation and data collection procedures, this study will examine good and poor comprehenders' reading times, use of lookbacks, and verbally reported identification of text inconsistencies in narrative and expository texts containing inconsistent information.

Method

Subjects

Five classes of fifth grade pupils from a rural school district in south central Texas were pretested with the SRA Reading Comprehension subtest. Pupils who performed within the top or bottom third of the SRA norm sample and whose test performance was consistent with teachers' perceptions of pupils' reading competence were judged as good and poor readers, respectively. There were 21 good and 39 poor readers identified.

Experimental Materials

Each subject was asked to read two passages used by Markman (1979), one containing an implicit inconsistency and one an explicit inconsistency, and two narrative passages developed by Winograd and Johnston (1982) containing inconsistencies. The Markman texts are one paragraph in length with the inconsistency being contained in the last half of the paragraph. The consistent information is similar for both explicit and implicit tests. However, the explicit inconsistency texts were longer than the implicit texts, since they contained more information related to the inconsistent concept. The Winograd and Johnston inconsistency was an anomalous sentence inserted approximately in the middle of the one paragraph narrative. For the Markman passages, text selection was random with counterbalancing for inconsistency type and order of passage.

Procedure

Research assistants worked individually with subjects. They explained and monitored operation of the computer presented text, asked and recorded response to inconsistency probes and scored the probe protocols.

Subjects were given directions similar to those used by Markman (1979) and Winograd and Johnston (1982). Subjects were told that the experimenters were field-testing children's stories. Pupils were asked to make suggestions as to changes that would make the story easier to understand. The post-reading probes were also adapted from Markman and Winograd and Johnston's work. The Markman probe procedures were replicated while Winograd and Johnston's first three probe questions were used. In addition to probe scores, a qualitative measure termed "quality of response" was used by the experimenters. This measure consisted of an analysis of research assistants' transcriptions of pupils' responses to the probe questions. Specifically, the written protocols were evaluated as follows: pupil identified the inconsistency (0); pupil commented on the content of the inconsistency, but did not identify it as an inconsistency (1); pupil did not refer to either content or nature of the inconsistency (2).

The Markman texts and the Winograd and Johnston passages were displayed one line at a time on a "page" of screen. Subjects initiated the presentation of each line by pressing a key labelled "↓" and could look back at any prior line of text by pressing a key labelled "↑". For the purposes of this study, a lookback was defined as a greater than one-second exposure of a previously read line of text. The computer recorded the amount of time in tenths of a second each line was exposed, the sequence of line exposures, and lookbacks. Following the text presentation, the post reading probes were administered.

Results

To analyze the effect of reader and text variables on pupils' reading time and use of lookbacks, a General Linear Model regression procedure was used. Each line accessed by the pupils was the unit of analysis for these dependent measures. Due to the unbalanced number of observation per cell, variance associated with the between-subject factor, reader type, was removed first. The effect of within-subject variables including the nature of the text (for Markman- implicit or explicit; for Winograd & Johnston - order of text presentation), the line (text line does or does not contain inconsistent information), use of lookbacks (whether or not the line was previously read), and the various interactions were analyzed on the residual variance. The within-subject factor, lookback, was included only in the model for reading time. Due to the repeated measure nature of the design and concern for failure to meet the assumption of homogeneity of the variance-covariance matrix, the Geisser-Greenhouse Conservative F-test was used.

To analyze the effect of reader type and text variables on pupils' identification of the inconsistency, i.e., probe score and quality of response, regression procedures similar to those described above were used. However, for these measures, the complete passage was the unit of analysis.

Markman Texts

Reading Time

Good readers spent less time reading text lines ($M=3.0$; $SD=1.4$) than did poor readers ($M=4.1$; $SD=2.2$), $F(1,20)=17.51$; $p<.01$. Both good and poor readers took less time during lookbacks ($M=3.0$; $SD=1.6$) than when initially reading lines of text ($M=3.9$; $SD=1.9$), $F(1,20)=19.71$; $p<.01$. Good and poor readers' time per line also was affected by both the nature of the inconsistency (Implicit or Explicit) and whether or not the line contained

inconsistent information, $F(1,20)=5.87$; $p<.05$. While statistically different, examination of the means and standard deviations for this interaction were minimal and uninterpretable.

Lookback

The proportion of lookbacks per line was greater for good ($M=.26$; $SD=.44$) than poor readers ($M=.14$; $SD=.35$), $F(1,20)=21.24$; $p<.01$. Moreover, there was a significant reader $\times$ inconsistency interaction, $F(1,20)=24.24$; $p<.01$. As seen in Figure 1 and reflected in tests of simple main effects, good readers engaged in more lookbacks on text lines that contained a semantic inconsistency, $F(1,20)=48.72$; $p<.01$ whereas poor readers had similar numbers of lookbacks whether or not the line contained an inconsistency, $F<1$.

 Insert Figure 1 about here

Verbal Identification of Inconsistency

Using Markman's (1979) probe procedure, good readers more readily identified inconsistencies ($M=4.8$; $SD=1.7$) than did poor readers ($M=5.6$; $SD=1.1$), $F(1,20)=5.46$; $p<.05$. With the quality of response measure, good readers were more sensitive to the identification of inconsistent information ($M=1.0$; $SD=.9$) than were poor readers ($M=1.6$; $SD=.7$), $F(1,20)=11.06$; $p<.01$.

Winograd and Johnston Texts

Reading Time

With the Winograd and Johnston narrative texts, good readers took less time to read text lines ($M=3.0$; $SD=1.4$) than did poor readers ($M=4.3$; $SD=2.0$), $F(1,20)=31.93$; $p<.01$. Both groups of readers took less time to read text lines during lookbacks ($M=3.1$; $SD=1.8$) when compared to the line initially read ($M=3.9$; $SD=1.9$), $F(1,20)=31.27$; $p<.01$. Good and poor readers' time differed depending on the order of the text, $F(1,20)=9.30$; $p<.01$ with poor

readers spending less time per text line on the second passage presented and good readers spending the same time per text line on both passages.

Lookback

Both reader type, $F(1,20)=8.52$; $p<.01$, and the nature of the line, $F(1,20)=15.43$; $p<.01$, affected the use of lookbacks. Specifically, good readers had a higher percentage of lookbacks ($M=.31$; $SD=.46$) than poor readers ($M=.16$; $SD=.37$) and both groups of readers used lookbacks more frequently on text lines containing inconsistencies ($M_s=.18$ and $.12$; $SD_s=.39$ and $.33$, respectively). Good readers generally used more lookbacks than did poor readers and they targeted more of their lookbacks to lines that contained the inconsistent information, $F(1,20)=5.34$; $p<.05$. This is similar to the interaction reported with the Markman text (See Figure 1).

Verbal Identification of Inconsistency

Using the variation of the Winograd and Johnston (1982) probe measure, none of the experimental factors influenced readers' probe score. However, with the quality of response measure, good readers identified the inconsistent information more readily ($M=.7$; $SD=.9$) than poor readers ($M=.4$; $SD=.9$), $F(1,20)=13.0$; $p<.01$.

Relationship Between Text Processing and Identification of Inconsistency

With both the Markman and Winograd and Johnston texts, good readers more often targeted their lookbacks to text lines containing inconsistent information and were also more likely to identify the inconsistent information. Using Yates' (1934) correction of Chi-Square for small and unbalanced cell size, we examined the relationship between lookback behavior and identification of the inconsistent information by good and poor readers. We used our quality of response measure to determine if the pupils identified the inconsistency. With this variable, approximately 90% of both good and poor

readers could be classified as either identifying the inconsistency or failing to acknowledge either the presence or content of inconsistent information.

When examining the lookback behavior of good and poor readers who identified the inconsistency in Winograd and Johnston's passages there appeared to be differences in the text processing behaviors of good and poor readers, $\chi^2=7.45$; $p<.01$. Seventy-five percent of the good readers lookback at the inconsistent information while over 70% of the poor readers did not lookback at the text lines containing inconsistent information (See Table 1).

For readers who failed to identify the Winograd and Johnston inconsistency, lookback behaviors of good and poor readers differed, $\chi^2=7.5$; $p<.01$. Good readers who did not identify the inconsistency looked back at inconsistent information in approximately half the texts read. However, lookbacks to the inconsistent information took place in only 15% of the texts read by poor readers. See Table 2.

Insert Table 1 and 2 about here

While there was a similar trend in the data for Markman texts, none of the Chi-Square analyses indicated significant differences in the frequencies across the cells, $p>.10$.

In examining these frequency tables, we were interested in the reading behaviors of poor comprehenders who identified the inconsistency. Particular attention was given to the poor readers who did not lookback at the inconsistency but identified it. We hypothesized that these poor readers may have spent more time reading the lines containing inconsistent information. To test this hypothesis, we ran a two factor ANOVA (Lookback at Inconsistent Information x Identification of Inconsistency), on poor comprehenders' reading time per line of text. None of the effects from this analysis were

significant, $p > .10$.

Discussion

Proficient learners possess not only substantial background knowledge but a variety of cognitive strategies to acquire and evaluate new knowledge and the competence to orchestrate the use of these strategies (Brown, Bransford, Ferrara, & Campione, 1983). Supporting these conclusions, we found that good readers differed from poor readers not only in their ability to verbally detect semantic errors in both narrative and expository texts, but in the strategic manner in which they read. For example, good readers generally used lookbacks more often, and they targeted their lookbacks to portions of the text that contained critical information, i.e. inconsistencies. When poor readers did use lookbacks they were not as likely to focus on text lines with the inconsistent information. While not all good readers identified the inconsistency, targeting lookbacks to inconsistent information was characteristic of the good readers who did identify the inconsistency. In contrast, few poor readers who identified the inconsistency used the lookback strategy.

Although good readers had faster reading times per text lines than did poor readers, the reading times of both good and poor readers did not differ when the text line contained inconsistent information. From our examination of similar elementary-aged readers who have been identified as good and poor comprehenders, strategic use of lookbacks rather than reading time appears to be a sensitive behavioral indicator of good readers' identification of the inconsistent information. With poor readers, neither use of lookbacks nor reading time appeared to be related to their verbal identification of the inconsistency.

Many of the good readers failed to identify the inconsistency in one or

both of the Winograd and Johnston' texts. Of the texts read by these pupils, half were read with lookbacks at the inconsistent information. Failure to identify the inconsistency despite the use of a relevant strategy may have been due to the generative ability of these pupils to weave anomalous or logically inconsistent information into the text. While pupils' nonverbalized thoughts regarding the text may have reflected this phenomenon, review of transcriptions of pupils' responses to probes failed to reveal any such pattern. Identifying anomalous material within a text is a rather unusual task. As such, these pupils may have recognized the unusual content as evidenced by their lookback behavior, but were unwilling to report on the inconsistency.

Brown, Campione and Day (1980) suggested that if instructors have a more detailed understanding of effective strategies for reading, these behaviors can be trained. It is our hope that our findings and the expanded use of microcomputer technology to assess readers' on-line behavior may add critical information for the instruction of at-risk learners.

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Figure Caption

Figure 1. Proportion of recall as a function of reader type and presence of inconsistent information in Markman Text lines.

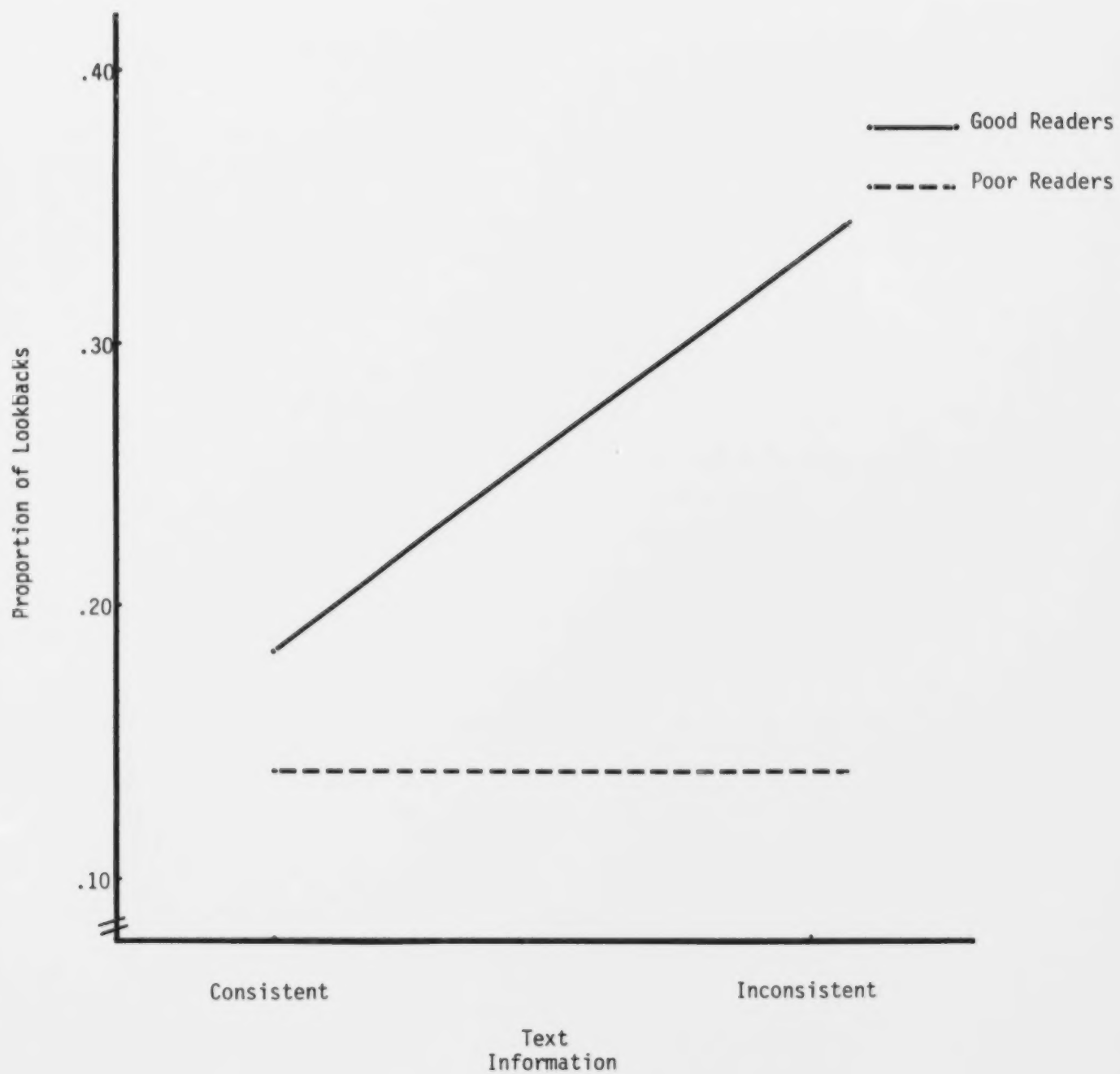


Table 1

Frequency of Texts Read by Good and Poor Comprehenders
Who Identified the Text Inconsistency

		Reader Type		
		Good	Poor	
Lookback at Inconsistency	No	6	13	19
	Yes	18	5	23
		24	18	42

Table 2

Frequency of Texts Read by Good and Poor
Who Failed to Identify the Inconsistency

		Reader Type		
		Good	Poor	
Lookback at Inconsistency	No	7	45	52
	Yes	8	8	16
		15	53	68